

1. An ultrasonic inspection system comprising:
  - an ultrasonic transducer having an ultrasound emitting surface;
  - a coupling medium acoustically coupled to the ultrasound emitting surface of the ultrasonic transducer and an object under inspection; and
- 5 a first temperature controller operable to maintain the temperature of the coupling medium at a first temperature.
2. An ultrasonic inspection system in accordance with claim 1, wherein the first temperature is higher than an ambient temperature and wherein the first temperature controller comprises a first heater and a first temperature sensor.
3. An ultrasonic inspection system in accordance with claim 1, wherein the coupling medium is water.
4. An ultrasonic inspection system in accordance with claim 3, wherein the water is stored in a reservoir.
5. An ultrasonic inspection system in accordance with claim 4, wherein the first temperature controller comprises a first heater, a first temperature sensor and a water circulator.
6. An ultrasonic inspection system in accordance with claim 4, further comprising a water level controller, operable to maintain the water at a predetermined level in the

reservoir.

7. An ultrasonic inspection system in accordance with claim 1, further comprising a second temperature controller operable to maintain the temperature of the object under inspection at a second temperature.
8. An ultrasonic inspection system in accordance with claim 7, further comprising an object holder operable to hold the object under inspection, wherein the second temperature controller is integrated with the object holder.
9. An ultrasonic inspection system in accordance with claim 1, further comprising a second temperature sensor operable to sense the temperature of the object under inspection.
10. An ultrasonic inspection system in accordance with claim 1, further comprising a transducer-position controller operable to control the relative positions of the ultrasonic transducer and the object under inspection.
11. An ultrasonic inspection system in accordance with claim 1, wherein the coupling medium is water, further comprising a water dispenser operable to supply water to form an acoustic coupling between the ultrasound emitting surface of the ultrasonic transducer and the object.

12. An ultrasonic inspection system in accordance with claim 11, wherein the water dispenser receives water from a reservoir of water maintained at a predetermined temperature.
13. An ultrasonic inspection system in accordance with claim 11, wherein the first temperature controller is integrated with the water dispenser.

14. A method for efficient transport of ultrasonic energy between an ultrasonic transducer and an object under inspection, comprising controlling the temperature of a coupling medium between the ultrasonic transducer and the object under inspection to be at a first predetermined temperature for which the attenuation of the ultrasonic energy in the coupling medium at the first predetermined temperature is reduced compared to the attenuation of the ultrasonic energy in the coupling medium at an ambient temperature.
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15. A method in accordance with claim 14, wherein the coupling medium is water.
16. A method in accordance with claim 15, wherein the first predetermined temperature is greater than 30° Celsius.
17. A method in accordance with claim 15, wherein the first predetermined temperature is greater than 35° Celsius and less than 50° Celsius.
18. A method in accordance with claim 15, wherein controlling the temperature of the coupling medium comprises:
- sensing the temperature of the coupling medium; and
- operating a first heater if the temperature of the coupling medium is below the first predetermined temperature.
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19. A method in accordance with claim 18, wherein the water is contained in a reservoir and wherein controlling the temperature of the coupling medium further comprises circulating the water in the reservoir to maintain an even temperature distribution.

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20. A method in accordance with claim 18, wherein the water is contained in a reservoir and further comprising controlling the level of water to be at a predetermined level in the reservoir.

21. A method in accordance with claim 14, further comprising:

sensing the temperature of the object under inspection; and  
operating the ultrasonic transducer when the temperature of the object under inspection is substantially equal to a second predetermined temperature.

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22. A method in accordance with claim 21, further comprising raising the temperature of the object under inspection when the temperature of the object is below the second predetermined temperature.

23. A method in accordance with claim 21, wherein the object is a microelectronic device and wherein the second predetermined temperature is representative of an operating temperature of the microelectronic device.

24. A method in accordance with claim 14, further comprising:

sensing the temperature of the coupling medium; and  
operating the ultrasonic transducer when the temperature of the coupling  
medium is substantially equal to the first predetermined temperature.

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25. A method in accordance with claim 24, wherein operating the ultrasonic  
transducer comprises the ultrasonic transducer sensing ultrasound emitted by the  
object.

26. A method in accordance with claim 24, wherein operating the ultrasonic  
transducer comprises:

the ultrasonic transducer generating an ultrasonic pulse into the coupling  
medium; and

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the ultrasonic transducer sensing ultrasound emitted by the object in response  
to the ultrasonic pulse.

27. A method in accordance with claim 24, wherein operating the ultrasonic  
transducer comprises:

the ultrasonic transducer generating an ultrasonic pulse into the coupling  
medium; and

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an additional ultrasonic transducer sensing ultrasound transmitted from the  
coupling medium through the object.

28. A method in accordance with claim 24, wherein the ultrasonic pulse generated by

the ultrasonic transducer has a center-frequency greater than 100 MHz.

29. A method for selecting a preferred temperature of a coupling medium in an ultrasonic inspection system, the method comprising:

- (a) for each operating temperature of a plurality of operating temperatures:  
controlling the temperature of the coupling medium to be  
approximately equal to the operating temperature;  
energizing an ultrasonic transducer to generate an ultrasonic wave in  
the coupling medium; and  
measuring the strength of the ultrasonic wave in the coupling medium;  
and

10 (b) selecting the preferred temperature dependent upon the strengths of the ultrasonic wave at the plurality of operating temperatures.

30. A method in accordance with claim 29, wherein selecting the preferred temperature is also dependent upon a maximum operating temperature of the ultrasonic transducer.

31. A method in accordance with claim 29, wherein selecting the preferred temperature comprises selecting the operating temperature that maximizes the strength of the ultrasonic wave.

32. A method in accordance with claim 29, wherein the ultrasonic wave impinges upon an object and causes a reflected ultrasonic wave and wherein measuring the

strength of the ultrasonic wave in the coupling medium comprises measuring the strength of the reflected ultrasonic wave.

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33. A method in accordance with claim 29, further comprising adjusting the distance between ultrasonic transducer and the object for each operating temperature of a plurality of temperatures

34. A method for ultrasonic inspection of an object having a predetermined operating temperature, the method comprising:

controlling the temperature of the object to be substantially equal to the predetermined operating temperature;

5 energizing a transducer to generate ultrasound in the object when the temperature of the object is substantially equal to the predetermined operating temperature; and

sensing the ultrasound emitted from the object.

35. A method in accordance with claim 34, wherein controlling the temperature of the object comprises:

sensing the temperature of the object; and

operating a heater if the temperature of the object is below the predetermined 5 operating temperature.

36. A method for efficient coupling of ultrasonic energy between an ultrasonic transducer and an object under inspection, comprising controlling the temperature of a coupling medium between the ultrasonic transducer and the object under inspection to be at a first predetermined temperature, wherein the acoustic impedance of the coupling medium at the first predetermined temperature is better matched to that of the ultrasonic transducer compared to the acoustic impedance of the coupling medium at an ambient temperature.
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37. A method in accordance with claim 36, wherein the coupling medium is water.